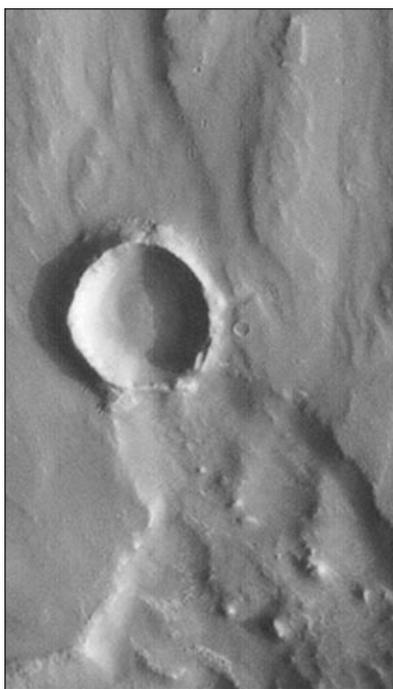
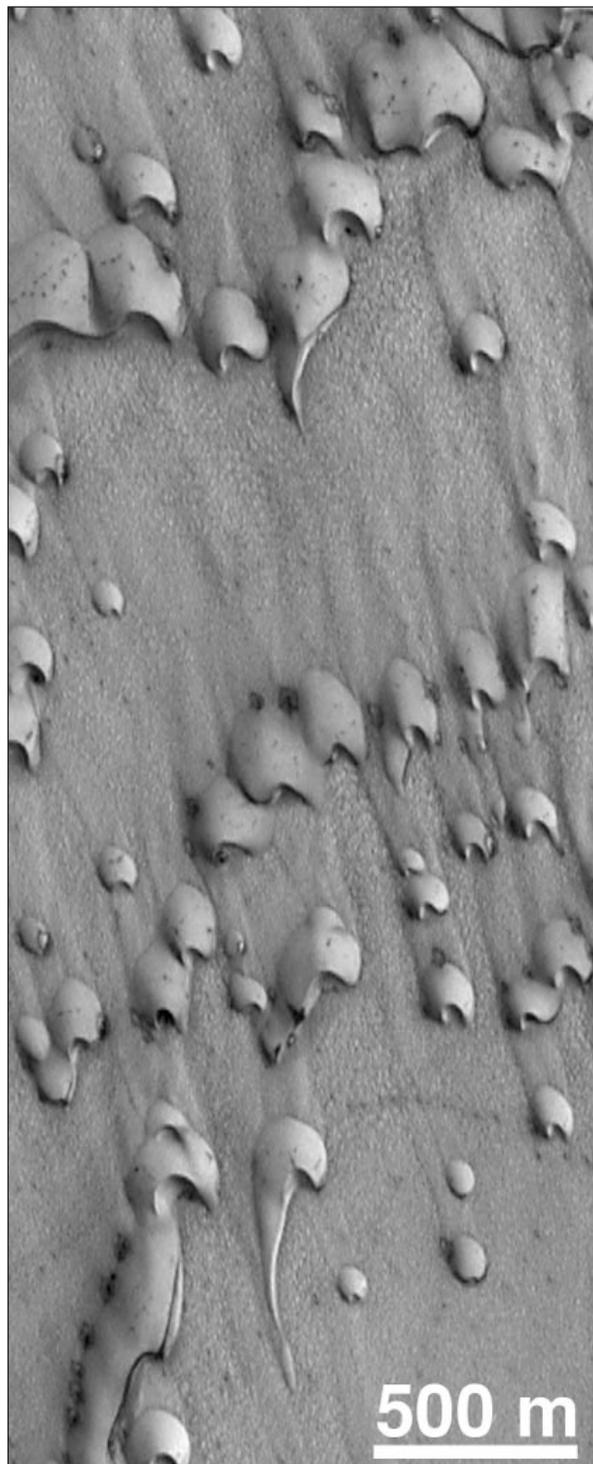
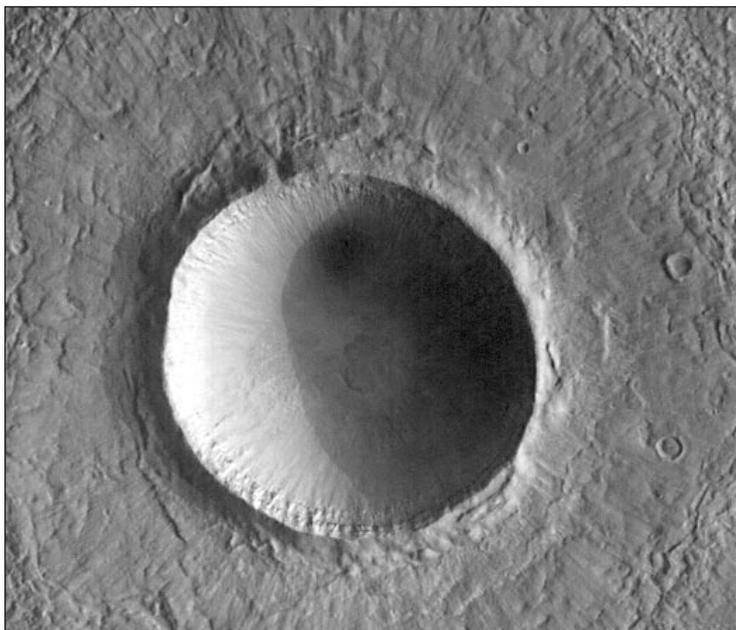


## *Mars in all its glory*



Summer vacation photos were never like this. JPL's Mars Global Surveyor, that intrepid explorer that has been studying the planet since 1997, recently snapped a new set of photographs, revealing surface detail never before seen. These detailed images, selected from a collage of 20 new snapshots, show everything from tiny ridges on valley floors and sand dunes, possibly iced on top, to craters formed by meteors and water ice clouds hanging over volcanoes. The images, taken by the camera on MGS and processed by principal investigator Dr. Michael Malin of Malin Space Science Systems, Inc., were unveiled this week at the fifth International Mars Conference, held at Caltech. The complete set of pictures illustrating a variety of geologic formations is available at <http://photojournal.jpl.nasa.gov> or <http://www.msss.com>.



# Fast-spinning mini-asteroid could be water-rich oasis

By DIANE AINSWORTH

A lumpy sphere about the size of a baseball diamond, known as 1998 KY26, is spinning so swiftly that its day ends almost as soon as it begins, said Dr. Steven Ostro, whose radar observations of the object appear in the July 23 issue of Science magazine.

1998 KY26, the smallest solar system object ever studied in detail, was observed June 2-8, 1998, shortly after its fortuitous discovery passing Earth at a close range of 800,000 kilometers (half a million miles), or about twice the distance between Earth and the moon. Ostro and an international team of astronomers, including 13 radar scientists and two optical observers from JPL, used a radar telescope in California and optical telescopes in the Czech Republic, Hawaii, Arizona and California to image the 30-meter (100-foot), water-rich ball as it twirled through space.

"The 1998 radar observations were the best anyone will be able to

make until the 22nd century," said Dr. Jon Giorgini, who was on the radar team at JPL, "so we were very lucky this asteroid was discovered right before it made a wonderfully close approach. From these observations we've tripled the time interval over which we can predict the asteroid's orbit accurately. We now know its orbit from 1911 to 2099. With optical observations, we only knew its orbit between the years 1959 and 2024."

Ostro said the observations are a breakthrough for asteroid science and a milestone in scientists' exploration of the small bodies of the solar system. "Enormous numbers of objects this small are thought to exist very close to Earth, but this is the first time we've been able to study one in detail," he said. "Ironically, this asteroid is smaller than the radar instruments we used to observe it."

1998 KY 26's rotation period was calculated at just 10.7 minutes, compared to 24 hours for Earth and at least several hours for

the approximately 1,000 asteroids measured to date. In addition to these findings, the minerals in 1998 KY26 are thought to contain about a million gallons of water, enough to fill two or three Olympic-sized swimming pools, Ostro said.

"This asteroid is quite literally an oasis for future space explorers," he said. "Its optical and radar properties suggest a composition like carbonaceous chondrite meteorites, which contain complex organic compounds that have been shown to have nutrient value. These could be used as soil to grow food for future human outposts. And among the 25,000 or so asteroids with very reliably known orbits, 1998 KY26 is in an orbit that makes it the most accessible to a spacecraft."

The solar system is thought to contain about 10 million asteroids this small in orbits that cross Earth's, and about 1 billion in the main asteroid belt between Mars and Jupiter. However, only a few

dozen of these tiny asteroids have ever been found and, until now, hardly anything was known about the nature of these objects.

Ostro and his colleagues used the 70-meter-diameter (230-foot) Deep Space Station 14 antenna dish at Goldstone, Calif., to transmit radar signals continuously to the asteroid, and turned one of two new 34-meter-diameter (112-foot) beamwaveguide antennas, the Deep Space Station 13 antenna, on the rocky object to collect echoes bouncing back. The two-antenna configuration, called a "bistatic configuration," is invaluable for studying very closely approaching asteroids.

"The asteroid was so close that we were receiving its signal back in less than five seconds," Ostro said. "That was too fast for one antenna switching back and forth from a transmitting to receiving mode. Our investigations of Toutatis and several other asteroids were primarily bistatic, but the only time we've ever used a bistatic radar for initial detection of an asteroid was during the Goldstone observations of asteroid 1566 Icarus in June 1968, exactly 30 years ago, during the very first asteroid radar tracking experiment."

1998 KY26's color and radar reflectivity showed similarities to carbonaceous chondrites, primordial meteorites which formed during the origin of the solar system, and unlike any rocks formed on Earth. They contain complex organic compounds as well as 10 percent to 20 percent water. Some carbonaceous chondrites contain amino acids and nucleic acids, which are the building blocks of proteins and DNA, and hence, are of interest to scientists trying to unravel the origins of life.

A second team of astronomers used optical telescopes to track 1998 KY26, which was discovered by the University of Arizona's Spacewatch telescope, the world's first instrument dedicated to searching for near-Earth asteroids. Dr. Petr Pravec of the Czech Republic's Academy of Sciences said collisions likely gave 1998 KY26 its rapid spin.

But one way or another, Pravec said, this object's 10.7-minute "day" is the shortest of any known object in the solar system. "The motion of the sky would be 135 times faster than it is on Earth," he said. "Sunrises and sunsets take

See KY26, page 4

## Special Events Calendar

### Ongoing

**Alcoholics Anonymous**—Meeting at 11:30 a.m. Mondays, Tuesdays, Thursdays (women only) and Fridays. For more information, call Occupational Health Services at ext. 4-3319.

**Codependents Anonymous**—Meeting at noon every Tuesday. Call Occupational Health Services at ext. 4-3319.

**Gay, Lesbian and Bisexual Support Group**—Meets the first and third Fridays of the month at noon in Building 111-117. Call employee assistance counselor Cynthia Cooper at ext. 4-3680 or Randy Herrera at ext. 3-0664.

**Parent Support Group**—Meets the fourth Tuesday of the month at noon. For location, call Jayne Dutra at ext. 4-6400.

**Senior Caregivers Support Group**—Meets the second and fourth Wednesdays of the month at 6:30 p.m. at the Senior Care Network, 837 S. Fair Oaks Ave., Pasadena, conference room #1. Call (626) 397-3110.

### Friday, July 23

**JPL Dance Club**—Meeting at noon in Building 300-217.

**JPL Perl Users Group**—Meeting at noon in Building 301-127.

### Wednesday, July 28

**JPL Drama Club**—Meeting at noon in Building 301-127.

**JPL Toastmasters Club**—Meeting at 5:30 p.m. in the Building 167 conference room. Guests welcome. For more information, contact Mary Sue O'Brien at ext. 4-5090.

### Thursday, July 29

**JPL Golf Club**—Meeting at noon in Building 306-302.

### Friday, July 30

**JPL Dance Club**—Meeting at noon in Building 300-217.

### Wednesday, August 4

**Associated Retirees of JPL/Caltech Board**—Meeting at 10 a.m. at the Caltech Credit Union, 528 Foothill Blvd., La Cañada.

**JPL Drama Club**—Meeting at noon in Building 301-127.

### Thursday, August 5

**JPL Gun Club**—Meeting at noon in Building 183-328.

### Friday, August 6

**JPL Perl Users Group**—Meeting at noon in Building 301-127.

### Wednesday, August 11

**Amateur Rocketry Club**—Meeting in 301-169 at noon. The club, now in its forming stage, meets once a month and launch rockets the following weekend. Anybody wishing to fly anything that could be called a rocket is welcome. Contact Chuck Lahmeyer, 4-0713.

# Deep Space 1 set to make close flyby

*Craft will pass within 15 km of asteroid 1992 KD*

By JOHN G. WATSON

Deep Space 1 has been remarkably successful with a complicated mission. Now the 44-member operations team, busy working out of mission control facilities on the second floor of historic building 230, is preparing to undertake a still more challenging assignment: the spacecraft is poised to encounter asteroid 1992 KD on Wednesday, July 28, at 9:46 p.m. Pacific time, marking the closest flyby of an asteroid ever attempted.

"Busy" may be an understatement. Unlike missions of yore, when flyby activities were solidified long in advance, at press time the small team continued to test and make modifications to the flyby sequence. With an overall compression of the development timeline, the encounter has proven to be challenging indeed in more ways than one.

The spacecraft's new autonomous navigation system, or AutoNav, will attempt to guide Deep Space 1 to just under 15 kilometers (9.3 miles) of the asteroid's surface. During the encounter, the spacecraft will fly past the asteroid at a relative velocity of about 56,000 kilometers per hour (35,000 miles per hour).

The encounter will provide an opportunity to complete the final 5 percent of testing of AutoNav, through which the spacecraft keeps track of its location in space and makes trajectory changes to remain on course.

Deep Space 1 has completed validation of its 11 other new technologies. Since testing of these technologies is at the heart of the mission, the flyby and its science return is a bonus. The ambitious encounter is a high-risk endeavor whose success is by no means guaranteed but whose findings, should there be significant data return, will be of great interest to the science community.

The asteroid and the space environment surrounding it make scientifically interesting targets for two advanced, highly integrated science instruments. During the flyby, an integrated spectrometer and imaging instrument is scheduled to send back images taken in infrared and visible light while an



**The Deep Space 1 spacecraft will zip past asteroid 1992 KD on July 28 at about nine miles, marking the closest flyby ever attempted.**

instrument that studies the three-dimensional distribution of ions and electrons, or plasma, will conduct several investigations.

Asteroid 1992 KD, which was discovered in May, 1992, by astronomers Eleanor Helin and Kenneth Lawrence of JPL, was chosen from more than 100 flyby possibilities.

In addition to their value for engineering future space missions, images and other data returned from this encounter will greatly assist scientists in their understanding of the fundamental properties of asteroids. Asteroid 1992 KD was chosen from more than 100 flyby possibilities. Its elliptical orbit curves within and outside Mars' orbit of the Sun, at its most distant extending more than three times farther from the Sun than Earth. Although scientists believe its diameter is approximately 1 to 5

kilometers (0.6 to 3 miles), they know little else about the object. With this flyby, they can learn more about its shape, size, surface composition, mineralogy and terrain.

The diminutive Deep Space 1 spacecraft, reaching just 2.5 meters (8.2 feet) in height, was launched on October 24, 1998, onboard a Delta II rocket from Cape Canaveral Air Station, FL. It marked the first launch of NASA's New Millennium Program, testing and validating new technologies in a series of deep space and Earth-observing missions. This is one of the first-ever deep space NASA missions to have technology, rather than science, as its key focus.

The technologies that have been tested on Deep Space 1 generally fall into two categories: those concerned with making

future spacecraft smaller and less expensive, and those concerned with making spacecraft more autonomous. Many of the technologies are designed to make spacecraft smaller, less expensive and capable of more independent decision-making so that they rely less on tracking and intervention by ground controllers.

The mission has exceeded almost all of its technology validation requirements by conducting more extensive tests than had been planned. As one dramatic example, the ion engine, which was required to thrust for a minimum of 200 hours, has in fact been operated for nearly 1,800 hours to date.

Deep Space 1 has also tested the feasibility of compressing mission preparation periods to as short as 39 months from initial concept through launch and of reducing mission budgets to substantially less than that of other recent NASA missions. Deep Space 1 is budgeted at \$152 million, including design, development, launch and operations.

Xenon, the same gas that fills photo flash tubes and glows brightly in many lighthouse bulbs, is the propellant for the ion propulsion system. Although this type of engine has been tested in labs and on Earth-orbiting satellites, only now has it been flight-tested as the primary propulsion source on a deep space mission. Having been proven in flight, ion drives are likely to be used on many future deep space and Earth-orbiting missions that would otherwise be impractical or unaffordable with conventional propulsion systems.

The mission also features three key experiments that give the spacecraft more autonomy in navigating and general decision-making. Autonomous navigation, when combined with ion propulsion, "is like having one's car find its own way from Los Angeles to Washington, D.C., arrive in a designated parking space, and do it all while getting 300 miles to the gallon," said Dr. Marc Rayman, Deep Space 1's chief mission engineer and deputy mission manager.

JPL manages the Deep Space 1 mission for NASA's Office of Space Science. □

# Near-Earth object scale helps risk communication

A new risk-assessment scale similar to the Richter scale used for earthquakes will help planetary scientists communicate better with the public and the media about the potential dangers posed by asteroids and comets that might collide with Earth.

Zero or one on the 10-point scale mean virtually no chance of impact or damage to Earth; 10 means a certain global climatic catastrophe.

The scale was created by Dr. Richard P. Binzel, professor of Earth, Atmospheric and Planetary Sciences at the Massachusetts Institute of Technology in Cambridge, MA. It is named the Torino Impact Hazard Scale for the Italian city in which the scale was initially adopted, during a June 1999 workshop led by the International Astronomical Union (IAU).

"This is a case of a high-consequence but low-probability event, and it is a difficult aspect of human nature to figure out what level of anxiety we should have about an approaching asteroid or comet," Binzel explained.

"I hope the Torino scale will put in perspective whether a Near-Earth Object merits public concern."

The scale is being endorsed officially today by the IAU in an announcement at the United Nations UNISPACE III conference in Vienna, Austria.

"What I find especially important about the Torino impact scale is that it comes in time to meet future needs as the rate of discoveries of Near-Earth Objects continues to increase," said Dr. Hans Rickman, IAU Assistant General Secretary.

Based on the orbit trajectory for a given near-Earth object, the scale takes into account the object's size and speed as well as the probability that it will come into contact with Earth. The scale can be used at different levels of complexity by scientists, science journalists and the general public.

Close encounters with Torino scale values from one to seven are categorized as "events meriting careful monitoring" to "threatening events." Certain collisions merit values of eight, nine or 10, depending on whether the impact energy is large enough to cause local, regional or global devastation.

No asteroid identified to date



ARTIST RENDITION BY DON DAVIS FOR NASA AMES RESEARCH CENTER

**An asteroid crashes into Earth's surface, kicking up enough debris to send the planet into a nuclear winter. The International Astronomical Union has endorsed a new risk assessment scale, called the Torino Impact Hazard Scale, to guide astronomers' ratings of the potential hazards of incoming objects.**

has ever had a value greater than one, noted Binzel, who has been working on the scale for five years. Several asteroids that had initial hazard scale values of one have been reclassified into category zero after additional orbit measurements showed that the chances of impact with the Earth were zero.

"Nobody should lose sleep over an asteroid in the zero or one category," he added. "Scientist-astronomers haven't done a very good job of communicating to the public the relative danger of collision with an asteroid. Those of us who are confronted with this should have some means of clearly communicating about it, so as to clearly inform but not confuse the public."

Increasingly sophisticated equipment, partially funded by NASA, such as the Lincoln Near Earth Asteroid Research (LINEAR) project at MIT's Lincoln Laboratory in Lexington, MA, is being used to detect and track a growing number of the estimated 2,000 near-Earth objects larger than about a half-mile (one kilometer) in diameter. The LINEAR project uses technology originally

developed for the surveillance of Earth-orbiting satellites. It has detected almost 250,000 asteroids to date, more than any other source. Only about 200 of those are considered near-Earth objects.

On the other hand, tiny meteorite fragments as big as grains of sand bombard Earth constantly, and objects the size of a small car hit a few times a year. An asteroid bigger than a mile across might hit once every 100,000 to one million years on average.

Once an asteroid is detected, scientists use tracking data from a tiny section of its orbit to calculate where it will be in 10, 15 or 100 years.

There is some uncertainty in this prediction because the orbit measurements are not perfect and the path of a near-Earth object may be altered by gravity if it passes close to Earth or another planet. As more information is gathered about a particular asteroid, its placement on the scale can be adjusted accordingly.

"The Torino scale is a major advance in our ability to explain the hazard posed by a particular near-Earth object," said Dr. Carl Pilcher, science director for Solar

System exploration in NASA's Office of Space Science.

"If we ever find an object with a value greater than one, the scale will be an effective way to communicate the resulting risk."

A more detailed explanation of the points on the Torino scale and related graphics are available at [http:// impact.arc.nasa.gov](http://impact.arc.nasa.gov). □

## KY26

**Continued from page 2**

about two minutes on Earth, but on 1998 KY26, they would take less than 1 second. You'd see a sunrise or sunset every five minutes."

Dr. Scott Hudson of Washington State University in Pullman found the asteroid's shape particularly surprising. Asteroids thousands of times larger have spherical shapes as a result of their large masses and strong gravitational fields, he said. 1998 KY26 is very unusual, however, because gravity and mass play no significant role in its shape. Instead, the object's shape is the result of collisions. □

# New deep sea probe ready to explore Monterey kelp tank

By DIANE AINSWORTH

A new aluminum deep sea probe, the prototype of one designed to withstand crushing pressures and extreme temperatures, is set to be lowered to depths of 9 meters (30 feet) in Monterey Bay Aquarium's giant kelp forest July 28 as part of NASA's hunt for clues to life's origins.

JPL's Lloyd French and Dr. Arthur "Lonne" Lane will sink the new package of underwater cameras, temperature sensors, optics and a spectrometer into the emerald waters of a controlled aquatic environment teeming with algae, kelp and fish to test the instruments for a more rigorous dive coming up in late August.

What does it take to prepare for these underwater feats of robotic ingenuity?

"About three or four checkout dives beforehand in the kelp tank and a lot of careful observation to make sure the instruments are performing the way they should," said French, who will don the diver's garb and descend with the latest instrument package. Lane, meanwhile, will monitor measurements from the instruments during the 45-minute dive, while Gindi French, lead mission operations coordinator, directs underwater radio communications with both the divers as well as other team members.

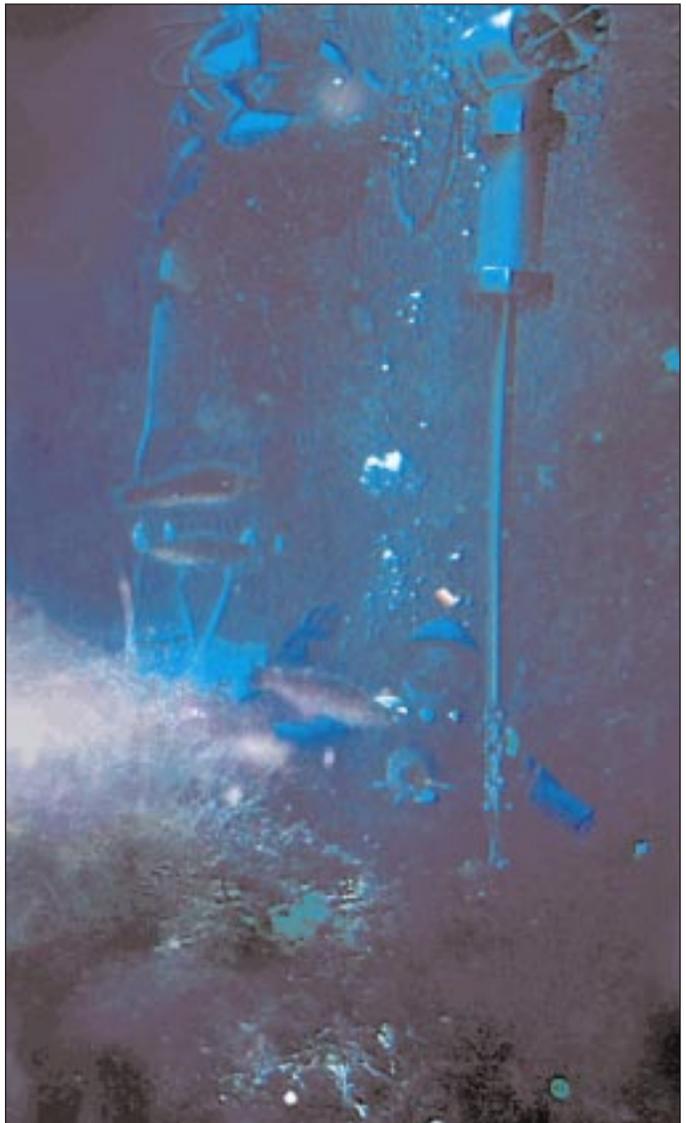
All of this is being done in preparation for a deep sea dive to volcanic vents off the coast of Tahiti in August and September. That dive, to be conducted by the French Institute of Research and Exploitation of the Sea, with involvement from the University of Hawaii and NASA/JPL, will test the capabilities of JPL's instrument package in volcanic vents found at depths of between 900 and 3,600 meters (2,970 and 11,880 feet). Most of these cracks are found in the sea floor and some are known to nurture primitive, jelly-like organisms and a pageantry of macabre bot-

tom-dwellers, such as salps, siphonophores, crustaceans and gelatinous animals only recently discovered at such depths.

"The instruments we are getting ready to test in a very controlled and safe aquatic environment will be able to record water temperatures in the throat of a vent, capture video and microscopic images of the walls of the vent, and record spectral or fluorescent signatures of minerals and bioluminescent life dwelling in these crevices," said Lane, lead scientist of the Underwater Volcanic Vent Mission probe. "If it works, we'll deploy it in Tahiti next month."

The Tahiti dive will be focused on gathering preliminary data as a stepping stone to future proposed planetary missions to explore more extreme liquid and ice environments on other planets. The development of new technologies and instrument housing to safeguard delicate sensors and imaging equipment in extreme, high-pressure environments will take many years to design and test in an ideal place such as Lake Vostok, Antarctica, an ancient bowl of fresh water that lies about 4,000 meters (13,200 feet) beneath the frozen surface. Eventually, these instrumented probes will be sent to the Martian polar caps and frozen oceans thought to exist on Jupiter's moon, Europa, and possible hydrocarbon lakes on Saturn's moon, Titan.

Instruments that can measure primitive biological communities in extreme environments can be tested now that scientists have discovered primitive life near volcanic vents. Gelatinous material in hydrothermal vents and organisms thriving outside of these remote cracks are found primarily at tectonic plate junctions at temperatures ranging from nearly 80 degrees Centigrade (170 degrees Fahrenheit) to almost 400 degrees C (750 degrees F) and at pressures as high as 6,000 pounds per



**JPL's Lloyd French operates a deep sea probe from the bottom of a 9-meter kelp tank in a test of precursor instruments last year.**

square inch. Typical water temperatures inside the vents range from 200 degrees C (392 degrees F) to more than 350 degrees C (662 degrees F) and drop quickly to ambient temperatures of about 4 degrees C (39 degrees F) outside of the vents.

To date, the organisms living near the vents have been found inhabiting waters only outside of the vents. But layers of strange, gelatinous material attached to the vents are presumed to be organic and biogenic. Researchers have reported that on at least one occasion the gel appeared to emanate directly from a vent throat.

"If there are indeed life forms present inside these vents, their presence may challenge accepted

notions of the temperature ranges at which life can function," Lane said.

Last year, Lane and French, in collaboration with Dr. Gary McMurtry of the University of Hawaii, developed and deployed an instrumented probe into the Forbidden Vent Fields near the summit of the Lo'ihii seamount, an underwater Hawaiian volcano. That probe was tested last year in Monterey aquarium's kelp tank before its deployment in Hawaii.

"The probe was capable only of limited visual imaging and temperature determination at depths of approximately 1,500 meters (4,950 feet)," French said. "Since that time, we've been able to increase the depths at which these instruments can operate to

**See Monterey, page 7**

# Jason-1 instruments pass critical performance tests

By DIANE AINSWORTH

With one instrument through the starting gate and into spacecraft integration, the second and third of five instruments that will fly aboard next year's Jason-1 ocean topography satellite have passed their environmental testing at JPL and Goddard and are about to be shipped to France.

Jason's microwave radiometer, designed and built at JPL to measure atmospheric water vapor, passed its preshipment review on April 14 and is now housed at Alcatel Space Industries, Inc., Cannes, France, which is under contract to Centre National d'Etudes Spatiales on the joint NASA-CNES mission. After additional testing, the instrument will start integration with the 500-kilogram (1,100-pound) spacecraft.

"We finished the environmental testing phase on the microwave radiometer in April and shipped the instrument to Alcatel, where an additional set of stand-alone performance tests were completed," said Randy Dodge, Jason-1 payload engineer at JPL. "The instrument is ready for installation in the payload module of the satellite." Two other instruments followed suit, passing their vibration, thermal vacuum and electro-magnetic compatibility tests in late May.

The Turbo Rogue space receiver, built by Spectrum Astro, Gilbert, Ariz., under contract to JPL, will help ground controllers determine Jason-1's precise location in space. The laser retroreflector array, built under contract to Goddard Space Flight Center, will provide ground stations with a reference point target for laser tracking measurements. Both are bound for Cannes in the near future, said Gary Kunstmann, Jason-1 project manager at JPL.

Jason-1 is an oceanography mission designed to measure sea-surface topography and to monitor global ocean circulation. With this mission data, scientists should be able to improve global climate forecasting and weather prediction models, assist meteorologists in monitoring worldwide climate events such as El Niños and La Niñas, and track the movement of ocean eddies and severe marine storms. The data are also being used for applications such as ship routing and fisheries management. The satellite's primary science



The Jason-1 spacecraft, successor to TOPEX/Poseidon, will carry five instruments to measure sea-surface topography and monitor global ocean circulation after its launch in May 2000.

instrument, a French-built, next-generation altimeter called Poseidon-2, is in development at the French space agency, Kunstmann said. The new altimeter is a low power, low mass, solid state instrument that has evolved from the currently orbiting TOPEX/Poseidon-1 altimeter.

"When combined with data from TOPEX/Poseidon, the Jason-1 data and potential follow-on missions will give us 15 to 20 years of coverage of ocean currents and circulation patterns, and allow us to greatly improve our ability to model ocean topography," Kunstmann said. "This state-of-the-art altimeter incorporates the latest electronics and antenna technologies at a substantially reduced cost."

Once the mission is under way, Jason-1 will be tracked using a network of 50 ground beacons worldwide. The onboard French radio tracking system, known as "DORIS," for Doppler Orbitography and Radio-Positioning Integration by Spacecraft, uses the Doppler shift on beacon signals to accurately determine the spacecraft's velocity and allow spacecraft engineers to extrapolate its trajectory with respect to Earth. This will be used along with the Turbo Rogue Space Receiver and the Laser Retroreflector Array to monitor the spacecraft's position.

Spaceborne altimeter missions require very precise measurements

of the spacecraft's velocity, altitude, latitude and longitude. These coordinates are critical to reliable measurements of sea-surface heights with respect to land and to three-dimensional modeling of ocean topography.

Like TOPEX/Poseidon, Jason-1 will be placed in a 1,336-kilometer high (830-mile) circular orbit around the poles, inclined 66 degrees to Earth's equatorial axis, Kunstmann said. The Jason-1 ground track will duplicate the TOPEX/Poseidon-1 ground track with each spacecraft crossing the same ground point one minute apart. The nearly identical orbits will allow validation of the Jason-1 instruments against the already calibrated TOPEX/Poseidon-1 instruments.

After calibration of the Jason-1 instruments, the TOPEX/Poseidon-1 spacecraft will maneuver to another orbit to improve spatial and temporal resolution of the measurements of the two spacecraft. From this vantage point, the spacecraft will be able to "see" up to 66 degrees north and south of the equator.

Every 10 days, the satellite will make repeat passes over the same regions of Earth and be able to provide uniform sampling of Earth's surface. The more advanced altimeter, however, will be able to measure ocean surface heights to an accuracy of about 2.5 centimeters (1 inch), and return data within hours after collecting it.

Spacecraft integration and testing started in March 1999 and will continue through early 2000. After completion of testing by the French space agency and Alcatel, tentatively set for April 2000, the satellite will be shipped to Vandenberg Air Force Base, Calif., for mating with the Delta-II launch vehicle. Launch is scheduled for May 18, 2000.

For further information about the Jason-1 project, visit <http://Jason-1.jpl.nasa.gov>. □

## Passings

**Robert Disney**, 46, died of pancreatic cancer on June 29 at Arcadia Methodist Hospital.

Disney had been an automotive technician in section 6422 since 1986.

He is survived by his wife, Jo Anne, sister Linda, brothers Al and Frankie. Services were held at St. Luke's Church in Temple City. □

**Ruth Vivian**, 69, a retired loan officer at the Caltech Credit Union, died of breast cancer on July 8. Vivian worked at JPL from 1973 to 1988.

She is survived by her husband, Howard, a former JPL engineer who worked at the Lab from 1955-89, and children Doug, Linda and Susan, and grandchildren Elisa and Brian. □



DUTCH SLAGER / JPL PHOTOLAB

Trish Smith-Araki, Occupational Safety Office manager, and Deputy Director Larry Dumas display the Laboratory's new safety poster.

## Posters highlight safety initiative

The NASA Strategic Plan states, "We will conduct our business with an enhanced fervor for safety". As part of the agency's Safety Initiative, JPL is committed to the safety of personnel, environment and all its assets.

How does that message translate into actions both at NASA and at JPL? NASA's Agency Safety Initiative provides a safety foundation to enable JPL and the other NASA centers to implement this safety message:

- Safety for the public. The public must be protected from harm.
- Safety for astronauts and pilots, because of the risk in high-hazard flight.

- Safety for employees. NASA and JPL will provide a safe and healthful workplace.

- Safety for high-value equipment, because we are entrusted by the public to ensure the safety of all NASA equipment.

The recently released NASA Safety Awareness Poster, shown above, will be displayed throughout the Laboratory with the message, "Mission Success Starts with Safety." These posters represent NASA's and JPL's continued safety-awareness efforts to be the nation's leader in safety and ensure the success of all NASA missions and operations. □

## Monterey

Continued from page 5

more than 4,000 meters (13,200 feet). The instruments are able to acquire temperature data, video imaging and high-resolution digital stills. This year we're also testing a new light source and spectrographic instrument to see if we can gather more information about the bacterial growth—what looked like thin veils of jellyfish-like material—we observed last year around the Lo'ihī vent."

During their mission in the South Pacific, scientists will use the French research vessel L'Atalante to test their instrument probe in several deep ocean volcanic vents. Using a deep submersible called Nautile, equipped with a robotic arm, they will place the 142-centimeter (56-inch) titanium tube housing the instruments inside the Pitcairn, McDonald and Teahitia seamounts to investigate the presence and nature of organic matter.

"One of the more interesting aspects of the mission lies in the challenge of detecting the presence of living organisms in extreme conditions in and near the

hydrothermal vents, something that visual imaging alone is unable to determine with certainty," Lane said. "However, by bathing them with ultraviolet light, many organic molecules can be induced to fluoresce in characteristic patterns."

Once the technology has been developed and demonstrated to work at depths of 4,000 meters (13,200 feet), the probe's external shell will be modified for use in sub-glacial lakes like Lake Vostok. The design may also become a prototype for a probe that could penetrate Mars' icy polar caps and search for microbial life, or explore a liquid ocean thought to lie 7 to 8 kilometers (4.3 to 5 miles) below the icy surface of Europa.

The Underwater Volcanic Vent Mission is in its second year of development and is an extremely low budget, fast-paced development. Much of the work is accomplished by participants in summer programs, such as project ALERT, the Minority Initiative Intern program, the Alliance for Learning and Vision for Underrepresented Americans program and the Summer Internship Research Fellowship program. □

## Retirees

The following employees retired in July:

**William Sjogren**, 37 years, Section 312; **William Thogmartin**, 37 years, Section 353; **Glenn E. Cunningham**, 33 years, Section

490; **Duane Batenhorst**, 32 years, Section 620; **Raymond Goldstein**, 32 years, Section 323; **Eugene Pawlik**, 32 years, Section 380; **Jess Thomas**, 29 years, Section 335; **Karen B. McLaughlin**, 25 years, Section 195; **Thomas Tolerson**, 14 years, Section 665. □

## LETTERS

On behalf of the Disney family I would like to personally thank each and everyone of you for your love and support during this most difficult time in our life. Bob was very proud of his job at JPL. He always spoke of the friends he made there and I know you were all very special to him. Remember Bob with laughter and love as he would want you to remember him. God bless each and everyone of you, and keep you all in His care always. With much love and friendship,

Jo Anne Disney

□□□

Queen Allen's family would like to thank her friends, colleagues, and co-workers for their support and prayers during her long illness, and for the lovely floral arrangement and expressions of sympathy after her passing. We love and miss Queen dearly, and it softens our sadness to know how loved and appreciated she was by her JPL friends.

Wayne Allen (Queen's son) and Family.

## FOR SALE

BABY BED, natural wood, bought in Japan, exc. cond., \$60. 626/585-1858.

BABY ITEMS, crib w/mattress, bassinet, swing, playpen, and a few odds and ends, \$100 for all. 626/446-2989, before 9 pm.

BASEBALL CARDS, unopened sets of Post Cereal brand baseball cards from 1992 thru 1995, \$15 per set or all 3 for \$30. 626/332-2682, Steve.

BEDROOM FURNITURE, complete set, Italian white lacquer,

Cal King bed with mirror headboard, two matching night stands, dresser with mirror, \$350/obo. 548-5082.

BICYCLE, girl, never used, bought new for \$115, \$75/obo. 323/221-8620.

BICYCLES, Specialized 1991 ALLEZ, 23 inch (58.4 cm) carbon fiber frame, Suntour 12 speed shifters, very light and stiff, choice of triathlon or standard drop bars, Lock pedals. \$350 firm; Fuji 12 speed, medium size, good condition, aluminum wheels, Suntour shifters, \$90 firm. 626/794-0886, Ted

BREAD MAKER, Hitachi, extra large loaves, like new, original box, sold for \$349, now \$100/obo. 891-6836, Steve.

BUNK BED, kids twin size, blue metal frame w/ 1 twin mattress, \$175/obo. 909/393-9586.

CHINA SET, 60-pieces, \$70/obo. 909/592-0780, Ana.

COMPUTER, Amiga with monitor, \$50. Printer, Brother Daisy Wheel, \$30, both working. 626/397-7065.

COMPUTER, Mac II FX, Conner 140 MB HD, 780 kB 3.5" FD, 1.4 MB 3.5" FD, 20 MB RAM, System 7.5.3, 32-bit addressing, 14" color monitor (16 colors), Global Village Teleport 33.6 fax/modem, Netscape Communicator, \$100, 541-0062.

COLLECTIBLES, McDonalds international bears set, \$25; McDonalds '99 beanie baby set, 12 in set, \$35; baseball or football cards 200 assorted, major players, stars, inserts, rookies, specify team or player and they will be inserted, \$20; autographed 8x10 Randy Moss rookie of the year w/cert of authenticity, \$75. 626/914-6083.

DESK, 4 drawers, excl. cond., w=45" x d=23" x h= 29", \$49.99. 626/574-3961

DINING ROOM FURNITURE: cherry wood server from Ethan Allen (Georgian Court Collection), dimensions 40"x21"x34", exc. condition, \$825; matching wall-mounted shelf, \$45. 626/577-8107.

DINING ROOM FURNITURE, table & 6 chairs, table in good condition 72"x46" 6 chairs (4 need re-covering) but in good shape, \$150. 541-9655

DINING ROOM FURNITURE, cherry wood server from Ethan Allen (Georgian Court Collection), dimensions 40"x21"x34", exc. condition, \$825; matching

wall-mounted shelf, \$45. 626/577-8107.

ENCYCLOPEDIAS, full set plus bookcase, \$40. 626/791-8848.

EXERCISE EQUIPMENT, Weslo pursuit 600, very good condition, original price \$179, will sell for \$50;

stair stepper, \$10, will deliver to lab if necessary. 626/345-0079.

FAX machine, Ricoh FAX20E, with paper rolls, works well, \$50. 891-6836, Steve.

FURNITURE, bedroom, heavy hand-carved cedar, chest of drawers, 2 night stands and a headboard, \$150/obo. 790-3390, Marj.

FURNITURE, vg. cond., queen sofa sleeper, \$200; chair \$75; solid oak rectangular coffee table \$100; end table \$75; lamp \$25; bakers rack \$250. 957-4770

FURNITURE, oak, tall bookcases, glass-front bookcase, TV/VCR stand, stereo cabinet, CD/VCR storage cabinet, children's bed frame, \$50 each; 5-drawer dresser, \$40; suspended rocker, \$40; TV turntable, \$10. 710-7694, or bbanerdt@concentric.net

FURNITURE, excellent condition, all less than 2 years old: Glass dining room table, \$100; coffee table, \$65; glass buffet stand,

Continued on page 8

\$25; black TV stand, \$30; black stereo cabinet with glass door, \$60. Older: 4 kitchen vinyl chairs, \$20. 626/398-1114, leave message.

FURNITURE, baby, Graco swing set with bassinet \$40, crib rocker \$10, Baby Bjorn carrier, \$25.

323/342-0607, Graco.

GARAGE SALE, Sat. & Sun. July 17-18, 4808 Mately Rd., signs on Foothill Blvd., clothes, toys and useful items. 248-4790.

GOLF CLUBS AND BAG, woman's, used, excellent for beginners, \$50/obo; TORCHES two lamps (6' tall, black) \$10 each/obo; foldable chair, \$10. 626/564-1225, Francois.

JUICER, Champion (w/ attachments and book), Avocado, works well, Orig. \$269, now \$50. 891-6836, Steve.

MODEM, Apple Geoport adapter fax/modem, Model M1694 express for power mac, \$25. 541-0062.

MODEM, ext. USR 28.8, \$50; Cardinal 33.6 \$25; USR Courier v, everything, \$150. 626/781-1779.

PHOTOGRAPHS 40"x30" color, framed, two tall-ship pictures taken by a professional photographer, very good condition, one of a Spanish tall ship in the San Francisco bay, one of a German tall ship near Puerto Rico, \$70/each, \$120/obo for both. 626/568-8298.

PICTURE FRAMES, three made of brass, 22" x 28". \$6.00 each, all 3 \$15.00/obo. 626/568-8296.

PRINTER, Xerox Diablo 630 daisywheel with print wheels/ribbons, excellent condition, works great. \$10/obo. 626/568-8298

REFRIGERATOR, small, personal size, 10 cu. ft., Kenmore, 2 yr. old, clean, vg. cond., \$100. 626/345-0079, Albert.

SHOES, Ballet and Tap, children's size 12, excellent condition, \$5 (ballet) and \$10 (tap). 626/794-0081, Bonnie.

SOFTWARE, Jeopardy (\$15), Eudora 4.0 (\$5), Unopened 1999 Yellow page USA 14 million listings, major search capabilities, \$9) Photo studio special edition (\$9), Macafee anti virus Suite (\$19, orig. \$79), Compton encyclopedia (\$9), Photo Studio (\$9), Bruderbund Multimedia Application Bible CD(\$15), American Greetings Card creator (15), Draw Print Studio (Premier edition with 33K clip art \$19), New Snappy 3.0 Video Capture System (\$39), 366-6134.

STAR TREK ornaments, 1993 Enterprise, 1994 Klingon Bird of Prey, 1995 Romulan Warbird, \$40 each. Also unopened box of 25th Anniversary Star Trek cards, \$30. 626/332-2682, Steve.

TABLES, glass, four 2-shelf tables with brass feet, three make up a coffee table (one round 2.5ft dia, two "half-moon"), fourth is a round end table (2.5ft diameter), \$125/obo. 909/592-0780, Ana.

TELEVISION, RCA ColorTrak, 25" screen, attractive cabinet, rotates on base, overall dimensions 34"x19"x30", good condition, \$40; indoor TV antenna (rabbit ears), rotating type, RCA, vg condition, \$10. 626/577-8107.

TENNIS RACKET, Prince Magnesium Pro, never been used,

w/cover \$28. 626/441-8572.

WASHER/DRYER, Amana, washer, elec., runs very well, \$50; dryer, 3 mo. use, \$400. 790-6764.

WEDDING DRESS, excellent condition, used once, kept in a garment bag, white straight dress with long sleeves, has a bow in the back, must see, \$40/obo. 626/568-8298

WHIRLPOOL TUB, beige, with all hardware, 40" x 60", 32" deep, \$150. 249-6786

## VEHICLES / ACCESSORIES

'87 BMW, 325i 6cyl, 4drs, auto, all pwr, a/c, AM/FM cassette, sunroof, cruise ctrl, 106K miles, runs great, \$4600. 626/568-3153, 8pm-1am.

'83 CADILLAC SEVILLE, 4 dr., sedan, 102k mi., sunroof, metallic beige, mint condition, \$2200/obo. 323/254-0620, Liz.

CAMPER SHELL, cab high, fits 1993 Ford S/B, excellent condition - in storage, reverse mounted sliding rear window, black w/ gray carpet inside, \$365/obo. 626/358-3730.

'88 DODGE Aeries, 4 dr., vg. cond., \$2300. 626/446-8551. ENGINE, Cadillac (will work in 91-95), new factory crated; 4.9L., V-8, \$1300/obo. 515-5761.

'92 FORD Escort LX, 4dr, 5 spd., burgundy w/brown interior, a/c, pwr locks/windows, am/fm/cassette, 85K miles, new tires, \$4,800/obo. 248-2561.

'97 GMC Sierra SL Pickup 1500 1/2 Long Bed. V6, autotrans w/OD, dual airbags, ABS (4 wheel), AC, CC, AM/FM Stereo cass., 34 gal fuel tank, bed liner & shell, emerald green, excellent condition, 21,800 mi., \$16,500. 626/798-5596

'85 HONDA Shadow, 700cc., V-Twin, shaft drive, automatic valve adjustment, 6 speed (w/overdrive), water cooled, excellent tires, low maintenance, reliable, good condition, red and black, includes street fairing and Tourmaster saddlebags, \$1,500. 626/794-0886, Ted.

'86 LEXUS 400, 4 dr., 29k miles, V-8, fully loaded, Nakamichi audio, \$34,500. 790-5195.

'88 MITSUBISHI Mighty Max, pick-up truck, 2wd, 2.6L, macro cab, rack over cab for long loads, \$2,500/firm. 956-6603

'65 MUSTANG, 289 engine, 4-spd. standard, primer color, suspension and engine have been replaced, needs starter and flywheel, \$1300/obo. 323/262-7685

'95 NISSAN Maxima SE, auto, fully loaded, spoiler, fog lamps, alloy wheels, exc. cond, \$10,500. 241-0872.

'94 OLDSMOBILE Cutless Sierra, 4 dr., 4 cyl., 42k miles, \$7500. 547-3975.

'97 PLYMOUTH Grand Voyager SE, 7 pass/5 dr, auto, dk.grn., 55K mi., loaded, keyless entry, CD/8 spkrs, cc, airbags, front/rear A/C, sep driver/pass, temp cntrls, tinted, roof rack, exclnt cond, all records, Blu Bk \$21K, sell for \$14,900/obo. 626/836-4960.

'87 TOYOTA Celica GTS, silver, very clean, extras, 103k miles, must sell, \$4500/obo. 248-8591.

'86 YAMAHA FZ 750, 36K miles, original owner, great bike, vg. cond., \$1,600. 345-0075, Albert.

## WANTED

NEWBORNS/TODDLERS, local child care services, licensed over 15 years. 352-5793, Dee Child.

SPACE INFORMATION/memorabilia from U.S. & other countries, past & present. 790-8523, Marc.

TRUCK, mid to full size with extended cab, older truck ok, good/excellent condition, V6 or better, will pay b/t \$6,000 to \$7,500. 626/355-6558.

## FREE

PLATE GLASS, 1/4", 64 3/4" x 43". 249-6786.

A LITTER of Dalmatian puppies rescued from a home in Victorville, all are dewormed, flea free, are being house trained, available for adoption now. 626/796-3378.

ORANGE Tabby kitten found, needs a good home. Flea free, dewormed, litter trained. 626/796-3378.

## FOR RENT

ALTADENA, furn. room w/cable TV, plus share 3-bd. quiet hilltop house, pool, view, 5 patios, all amenities incl. laundry, kitchen, etc., off-str. parkg. spot, 3 mi. JPL, smoking OK, should like classical music, \$500/incl. util., + deposit. 626/794-1050, after 7 p.m., Harry.

ALTADENA, attached studio apt., 2 miles to JPL., beautiful yard, area for gardening, all utilities included, \$500/month. 626/798-0329.

CANOGA PARK, house, 2 bd, 1ba, garage, laundry hook up, large yard, 40min/JPL, \$800/mo. + util. 626/791-9049, Suzi.

CLOSE TO JPL, furnished room/bath w/view in lovely home, quiet area, use of washer/dryer, garage and swimming pool, 7 miles from JPL, utilities paid, non-smoker, \$425/mo. 323/256-0535.

MONTROSE, two story townhouse style, 3 mi. to JPL, 2 bd., 1.5 ba., stove, refrigerator, dishwasher, garbage disposal, a/c; \$750 + \$300 security deposit. 310/470-3330.

NORTH ALHAMBRA, large one bedroom duplex in good residential area, 700 square feet, clean, carpeted, one car garage, stove, window air conditioner, water, trash and gardener provided. \$625/mo. 683-9935 eves.

PASADENA, room for rent in 3br., 3 ba., apt, share with 2 male students, avail immed., fully furnished, a/c, laundry, parking, 2

mi. from PCC & Caltech, \$425/mo. + 1/3 util. 626/351-9641.

SOUTH PASADENA, fully furnished studio apt, nice area at 1718 Huntington Dr, between Marengo and Milan sts., car space, laundry facilities on premises, utilities paid, Non-smoker, no pets. \$565/mo. 626/792-9053, Marilyn.

## REAL ESTATE

ALTADENA, 3 br., 2 ba., view to ocean, 3/4 acre, exclusive area, 10 min to JPL or Caltech, grafsoft@thegrid.net or 759-8953. BIG BEAR, new cabin 2 blocks from lake, 2 bedroom, 2 bath, mud/laundry room, \$129,000. 909/585-9026.

LA CANADA, 3 bd., 2 ba., family rm., newly refurbished inside, new landscaping, \$399K. 244-8253.

PASADENA, townhome built in 1998 near Rose bowl (3.5 miles from JPL), in a gated community, approx., 1,400 sq.ft, 3bd, 2.5ba, 2-car attached garage, alarm, ceiling fans w/lights in all bedrooms, covered balcony off the master bedroom, wood floors everywhere, all Corian counters, large enclosed backyard fully landscaped with automatic sprinkler system, palm/fruit trees, pool, Jacuzzi, basketball court, \$275,000/obo. 626/568-8298.

SUNDLAND, Shadow Hills, horse ranch, lease-buy option, 5.5 acres of rolling hills, spacious, 4 bd., 3 ba., 20 avocado trees, 3 horse corrals, quiet, \$50,000 purchase/credit; rent \$2,100/mo. 626/584-6526.

TEHACHAPI, custom house, 2600 sq. ft., 3 bd., 2 ba., 2 car garage, Dutch barn, panoramic views, lr, dr, 2.5 acres, many oak trees and pines, omc, \$155,000. 626/794-5858.

## VACATION RENTALS

BIG BEAR, cabin, quiet area near village, 2 bd., sleeps 8, completely furnished, F/P TV/VCR, \$75/night. 249-8515.

BIG BEAR, cabin, near lake, forest, shops, golf, Zoo, fully furnished, TV, VCR, BBQ, Fireplace, sleeps 6, JPL disc., rate from \$65 per night. 909/599-5225.

BIG BEAR LAKEFRONT, 1 bd, 1 ba., condo, sleeps 4, full kitchen, gym, indoor pool, Jacuzzi, BBQ areas, Oct. 22-29, \$75/night. 323/296-6641.

BIG BEAR LAKEFRONT, luxury townhome, 2 decks, tennis, pool/spa, beautiful master bd., suite, sleeps 6. 949/786-6548.

BIG BEAR, 7 mi. from slopes, full kitchen, f/p, 2 bedrooms, 1 bath, sleeps 6, reasonable rates; 2 night minimum, no smokers, no pets, exc. hiking, biking, fishing nearby. 909/585-9026, Pat & Mary Ann Carroll.

CAMBRIA, ocean front house, sleeps up to 4, excellent view. 248-8853.

HAWAII, Kona, on 166 feet of ocean front on Keauhou Bay, private house and guest house, comfortably sleep 6; 3 br., 2ba., rustic, relaxing and beautiful; Swimming, snorkeling, fishing, spectacular views, near restaurants, golf courses and other attractions. Space available after September 22. 626/584-9632. HAWAII, Maui condo, NW coast, on beach w/ocean vw., 25 ft. fr. surf, 1 bd. w/loft, compl. furn., phone, color TV, VCR, microwave, dishwasher, pool, priv. lanai, slps. 4, 4/15-12/14 rate: \$95/nite/2, 12/15-4/14 rate: \$110/nite/2, \$10/nite/add'l person. 949/348-8047.

LAKE TAHOE NORTH SHORE, only two summer weeks left--extra special discounts for last week of Aug. or first week of Sept., 2 bd., 2-1/2 ba., sleeps 6-7, private sandy beach, pool, great location, all amenities, great hiking, kayaking, river rafting, bike trails, 2 miles to North Shore casinos, JPL discount. 626/355-3886, Rosemary or Ed.

MAMMOTH condo, studio + loft, 2 ba., fireplace w/ wood supplied, Jacuzzi, sauna, game rm., color CB. TV/VCR, full kitchen w/microwave, terrace, view, amen., low summer rates. 714/870-1872.

MAMMOTH, Chamonix condo, 2 bd., 2 ba., sleeps 6, fully equipped elec. kitchen, microwave & extras, fireplace, cable TV, VCR, FM stereo, pool & sun area, o/d Jacuzzi, sauna, game, rec. and laundry rms, BBQ area, conv. to shops, hiking, summer events, daily/weekly rates. 249-8524.

MAMMOTH, Snowcreek, 2 bd., 2 ba., + loft, sleeps 6-8, fully equipped kitchen incl., microwave, D/W, Cable TV, VCR, phone, balcony w/view to mtns., Jacuzzi, sauna, streams, fishponds, close to Mammoth Creek, JPL discount. 626/798-9222 or 626/794-0455.

MAZATLAN, 7 nights, wk. of Oct. 11-18, 1999, Pueblo Bonito Resort on the beach, 1br., sleeps up to 6, partial kitchen, airfare not included, \$750. 626/917-0231, Dwaine.

LAKE TAHOE SOUTH KEYS, waterfront home, 4-bd./3 ba. (1 bedroom & living room upstairs - handicap access fair) sleeps 12+, fireplace on two levels, decks overlooking private dock & ski lifts, gourmet kitchen, bicycles, 20' sail & paddle boats, 3 color TVs, VCR, stereo with tape & disc, assn. indoor & outdoor pools, hot tub & beach; 8 lighted tennis courts, 10 min. to skiing, casinos, golf, one hour to Western Sierra wine country, \$1,095/week for high season [15 June to 15 Sept; 22 November to 1 March]; \$495/week low season, plus cleaning fee of \$90, 3-day minimum. 626/578-1503, Jim Douglas.

OCEANSIDE, on the sand, charming 1 bd. condo, panoramic view, walk to pier or harbor, pool, spa, game rm., sleeps 4. 949/786-6548.

PACIFIC GROVE house, 3bd, 2 ba, fp, cable tv/vcr, stereo/CD, well-eqpd kit w/microwave, beaut. furn. close to golf, beaches, 17 Mile Dr, aquarium, Cannery Row, JPL discnt. 626/441-3265.

ROSARITO BEACH condo, 2 bd., 2 ba., ocean view, pool, tennis, short walk to beach on priv. rd., 18-hole golf course 6 mi. away, priv. secure parking. 626/794-3906.

## NOTICE TO ADVERTISERS

All housing and vehicle advertisements require that the qualifying person(s) placing the ad be listed as an owner on the ownership documents.

## Universe

Editor

Mark Walton

Photos

JPL Photo Lab

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